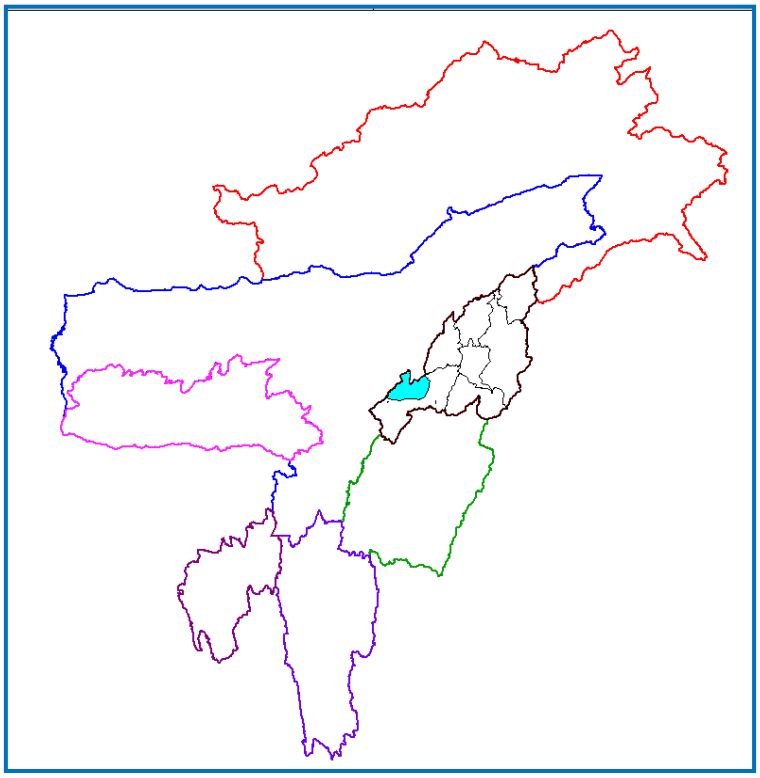
Technical Report Series: D

No:

Ground Water Information Booklet
Dimapur District, Nagaland



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

September 2013

DIMAPUR DISTRICT AT A GLANCE

SL No	ITEMS	STATISTICS
1	General Information 1) Geographical area(Sq Km)as on 2011 11) Administrative Divisions i) Number of blocks ii) Number of Villages iii) Population(as per 2011 census) iv) Average annual rainfall (mm)as on 2012	 927 04 219 379769 1504.7
2	Geomorphology i) Major Physiographic units ii) Major drainage	 Alluvial plain,Low to Moderate ridge,Moderate hills & High hills. Dhansiri ,Diphu river and there tributaries.
3	Total Forest Area (hac)as on 2010-11	1282.38
4	Major soil type	Alluvial and Residual soil
5	Area under principal crops as on 2011-12 in hac	6230
6	No of Ground water monitoring wells of CGWB as on 31-03-13	26
7	Predominant Geological formation	Barail,Surma,Tipam,Dupitila and Sub recent to Recent
8	Hydrogeology i) Major water bearing formation ii) Pre mon soon depth to water level 2011-12 iii) Post monsoon depth to water level during 2011-12	 The unconsolidated alluvial deposits and semi consolidated formation of Dihing and Tipam formation occurring in the intermontane valleys. 1.86 to 10.25mbgl 1.75 to 5.70 mbgl
9	Ground water exploration by CGWB AS ON 2013	09
10	Ground Water Quality	Genarally good &suitable for domestic and industrial purposes. However, the shallow water bearing zone in the valley area, the iron content in ground water is more than permissible limit.
11	Dynamic Ground Water Resources as on 2009 in ham i) Net ground water availability ii) Net ground water draft iii) Stage of ground water development	 15320 286.6 1.87%
12	Awareness and Training activity as on 31-03-13	

	i) Mass awareness programme & water management training programme organizes ii) Efforts of artificial recharge & rainwater harvesting a) Project completed by CGWB b) Project completed under technical guidance of CGWB(NER) c) Project completed under central sector scheme	
13	Ground Water Control & Regulation(No of OE blocks/Critical blocks/Semi critical blocks/Notified area	Nil
14	Major ground water problems and issues	District is receiving good amount of rainfall but due to hilly nature most of it goes as runoff. As aresult ground water recharge is little.Ground water development and management inn the hilly area of the district is a problem.

1.INTRODUCTION:

Dimapur district was created as the eight district of Nagaland in December 1997 out of Kohima district. The district draws its name from the Kachari dialect; DI- meaning river, MA- meaning great or big and PUR- meaning city, together connoting the city near the great river.

Dimapur district of Nagaland lies between 25 48 26 00north latitude 83 30 & 93 54 east longitude. The district is bounded by Kohima district on the south and east, karbi angling district of Assam on the west, parts of Karbi Anglong and stretches of Golaghat district of Assam in the west & the north.T5he district comprise of four blocks and 7 circles with an area of 927 sq km.

The district has a heterogeneous population with majority comprising of Naga tribes from all over the Nagaland. There is sizable population of non-tribal living in the town areas. The total population of the district as per 2011 census is 379769,out of which 182479 is in urban and 197290 is rural population.

2.ADMINISTRATIVE DIVISION:

Dimapur district is divided into 7 numbers of administrative circles and 4 numbers of R.D. blocks with a total of 219 villages. (Table-1)

Table-I Administrative Units.

District	No of Circles	No of R.D. Blocks	No of Villages
Dimapur		04	219

3.POPULATION:

As per 2011 census, Dimapur district has a population of 379769. Its population growth rate over the decades 2001-2011 are 0%. The district has a heterogeneous population with the majority comprising Naga tribes from all over Nagalands.Table-2

Table-2 Population Density of Dimapurdistrict (as per 2011 census).

District	Area in Sq Km.	Population			Density	Decadal growth rate(%)
Dimapur	927	379769	197290	182479	410	0

4.LAND USE,IRRIGATION AND CROPPING PATTERN:

Land use pattern: The land use pattern of Dimapur district during 2011 is given below,Table-3

Table-3. Land Use Pattern

Sl No	Area under different land use	Area (in Sq Km)
1	Total forest area	8.12
2	Area not available for cultivation a)Barren and Uncultivable land b) Land put to non agricultural use	 a)N.A B) 42
3	Net irrigated area a) Surface water source b) Ground water source	 a) 144.44 b) Nil
4	Gross irrigated area	N.A
5	Area sown more than once	N.A
6	Total cropped area	N.A

5.Irrigation:

Dimapur district is occupied by hilly terrain with rugged topography with some valleys like Ghaspani-Jaluki and Dimapur valleys. Hence there is limited availability of land in plains and valleys for cultivation. In Dimapur district 24 numbers of lift Irrigation Schemes,3 no's of deep tube well and 2 shallow tube wels have been commissioned ,but all are not in use at present.

Cropping Pattern:

In Dimapur district both Kharif and Rabi crops grown. The main crop cultivated in the area is Paddy (Rice). The pattern of cultivation is of two types- permanent cultivation and shifting cultivation (Jhum)

Permanent cultivation is practiced in the valley areas and is restricted to Dimapur and Ghaspani- Jaluki plain of Dimapur district. Shifting cultivation (Jhum) is practiced on the hill slope of the district where water is not available for irrigation. Besidespaddy, other crops like Maize, wheat, Cereals, Pulses, Oilseeds, Frits,Vegitables and some commercial crops like sugarcane, cotton jute are also grown.

In Dimapur district, occurrences of low grade clay minerals and oil and Natural Gas have been reported in 6he Dimapur valley, but so far there is no major mining activity in the entire district.

6.HYDROMETEOROLOGY:

Dimapur district enjoys a sub-tropical humid climate with maximum temperature reaching upto 36 C and minimum winter temperature going down to 3.2 C. Humidity is very high ranging from 74 to 87%. The area experiences phenomenal influence of the South –West tropical monsoon which persists from May to September with occasional winter shower. T6he average annual rainfall for the last seven years (2003-2009) recorded for Dimapur district is 1101.79 mm with 623.6 mm average rainfall and 62 no of rainy days recorded for the year 2009. The average annual rainfall for the year 2012 is 1504.7 mm.

7. GEOMORPHOLOGY AND PHUSIOGRAPHY:

Dimapur district constitute primarily of two district topographical units, one is hilly and the other is intermontane narrow valley to wide elongated valleys. The general topography of the district is rugged and rough except the intermontane valley occurring in the North Western part around Dimapur and Jaluki-Medziphema area. The general trend of the hills is NE-SW direction with moderate to steep slope. The entire district can be grouped into four distinct physiographic units and are given below:

1) Alluvial plains

11) Low to moderate linear ridge

111) Moderate hills and

1V) High hills.

8.SOILS:

Soils have been derived from the Tertiary group of rocks. The most common type of soil found in the district is red clay soil.

9.DRAINAGE:

The district is drained by two major river system viz -Dhansiri river flowing from South West to North East direction on the south west part of the area and Diphu river flowing from south to north and on the south western part later on meandered with Dhansiri river in Dimapur valley. These two rivers viz Dhansiri and Diphu and their tributaries srve as the main surface water sources for irrigation and drinking water in Dimapur district. The drainage patterns are sub parallel and dendritic controlled by the structures and lithology of the area.

10.GEOLOGY:

The district is underlain by formations ranging from Cretaceous to Recent and represents northern extension of Arakan-Yoma Range of Myanmar. The Tertiary formation comprises shale, siltstone, sandstone, conglomerates belonging to Disang, Surma, Tipam and Dihing groups of geosynclinals shelf facies and the Recent deposits comprise of alluvial formations.

Sub surface geological data is available for only Dimapur valley occupying northwester most part of the district bordering ASSAM plain. Lithological logs of tube wells indicate that alluvium occurs along thye banks of Dhansiri and Diphu Rivera and its thickness gradually increases owards northeast. The thickness of alluvium is limited in the south and central part of the valley and occurs near south of Rangapahar-Singrijan- Diphupar area. In this part , a pebble –boulder bed with predominantly argillaceous matrix occurs with thickness range of 4-50 m. In the north-western part of the area the thickness of pebble/boulder bed is 3-4 m only within 30 m depth. This bed in the north-eastern merged with sand horizon. The aquifer material occurring below this zone consist of unconsolidated sandstone intercalation of 3-5 m thickness,inter –bedded with plastic and sticky mottled clay,mudstone,claystone.From the available lithology, thickness of aquifer granular materials are found to vary from 10-82m, 8-57m and 12-46 m within depth range of 100m,100-200m

and 200-300 m and thickness of materials increasing in north-eastern part in all cases. From the lithology data it is also clear that good granular zones are to be encountered within 150 m depth below which argillaceous sediments dominate down to explored depth of 300 m.

In Ghaspani-Jaluki valley areas, pebbles and boulder formations of considerable thickness are likely to be encountered within depth range of 100 to 150 m bgl.

11.HYDROGEOLOGY:

Hydrogeologicaly, the district is underlain by two district groups of rocks i.e. semi consolidated and valley fill deposits where ground water occurs under water table to confined condition. The water bearing formation are identified as unconsolidated alluvial deposits and semi consolidated formation of Dihing and Tipam formations occurring in the intermontane valleys like Dimapur,Jaluki-Medziphema and fractured zones of semi consolidated and consolidated formations.

Study of available subsurface data revealed that ground water development potentiality is restricted to construction of open wells having depth of 5 to 20 meters and deep tube wells down to 100 to 300 meters depth. The yield of the tube wells ranges from 10 to 45 m3/day with a reasonable drawdown. Water bearing formation pertaining toi Tertiary deposits are found to have moderate potentialities which can sustain deep tube wells having yield prospect varying from 10 to 20 m3/hr. The valleys underlain by Tipam sandstone form good aquifers with yield prospect ranging from 30 to 80 m3/hr. In the consolidated formations ground water abstraction structures can be constructed in structurally weak zones. Ground water at deeper levels is found to occur under semi confined to confined conditions. Auto flow zones have also been identified in some parts of the districtmainlr in and around Dhansiripar areas.

AQUIFER GEOMETRY:

Based on the lithological data available in the district, the geometry of the aquifers can be inferred as follows:

1) Shallow aquifer.

Dimapur and Ghaspani-Jaluki valleys being a piedmont alluvial plain and an intermontane valley respectively, the formations in the area are valleyfill deposit comprising unconsolidated Recent to Sub- Recent fluviatile formations composed of Clay, Silt, Sand (fine to medium) Gravel, pebbles and boulders. The thickness of the aquifers varies from place to place and often has a limited areal extent. In the foothills of the valleys, the top soil is composed of sand, silt and clay which varies in thickness from 0.5 to 2.0 m underlain by a mixture of boulder, pebbles, sand and clay that continues up to the depth of 15 to 20 m and serve as the potential aquifer for the shallow Dug Wells. In the North-western part of Dimapur valley, the top soil is comparatively thin and in underlain by sand (fine to medium) and sandy clay with a thickness that varies from 15 to 20m. This is underlain by sandstone/soft sandstone of friable by nature of Tertiary age. The shallow aquifer in the valleys occurs in unconfined condition.

DEEPER AQUIFER

The deeper aquifer of the area is under Semi-confined condition. The aquifer comprises fine to medium sand, sandstone (friable) and rarely boulder, pebbles and inter-bedded mottled clay. There are intercalations of sandy clay, sand and sandstone / soft sandstone, which are often discontinuous.

AQUIFER WITH GROUND WATER REGIME, DEPTH TO WATER LEVEL:

Ground water in the valley occurs in unconfined condition at shallow depth and semi confined at deeper depth. In unconfined aquifers depth to water level occurs within the range of less than a meters to 10 mbgl and piezometric level of confined aquifers ranges from 10.24 m bgl to less than 1.0 m agl

12.PRE MONSOON AND POST MONSOON WARTER LEVEL TREND(as on 2013)

The pre monsoon water level in the shallow zone (dug well zone) of Dimapur ranges from 1.86 to 10.25 mbgl and the piezometric level varies from 5.20 to 19.09 m bgl. During post monsoon the depth to water level in Dimapur recorded between 1.75 to 5.70 mbgl and the piezometric level varied between 4.49 and 17.92 mbgl. Water level fluctuation between pre monsoon and post monsoon ranges from 0.11 to 5.02.

13. GROUND WATER QUALITY

In general, the ground water of the district is slightly alkaline to neutral in nature. Electrical conductivity, total dissolved solids are very less, indicating soft water. Other constituents are within permissible limit of drinking, agricultural and industrial water standard set by BIS. So far no chemical pollution has been detected in the district. However, the shallow water bearing zone in the valley area of the district, the Iron content in ground water is more t5han permissible limit.

14. AQUIFER YIELDS AND AQUIFER PARAMETERS

The data 0f the deep tube wells of different depth constructed in the district by the Central Ground Water Board, North Eastern Region, Guwahati and the Directorate of Geology and mining, Dimapur, Govt. of Nagaland revealed that ground water in the valley area occurs under Semi-confined condition. The yield of tube wells in Dimapur valley varies from 52 lpm at Rangapahar to 1025 lpm at Purana Bazar (Table-3) . The Piezometric level in the valley varies from 10.59m bgl at Disagophu village to the perennial auto flow condition (Artesian) at Dhansiripar and Rangapahar. The drawdown of the wells varies from 28.91m at Teyiphe II village to 3.50 m at Rangapahar. The discharge of the Tube wells of deeper aquifers in Dimapur valley increases towards North-East. The depth of the bore hole drilled in the area varies from 76m to 301m. However, the depth of the assembly of the wells varies from 61m to 281m depending upon the availability of the aquifer from location to location. The thickness of the aquifer tapped varies from 55.00m to 100.00m.

The transmissivity of the aquifers ranges from 4.75m^2/day to 301 m^2/day . The specific capacity of the aquifers varies from 5.02 lpm/m at Lumthi colony Dimapur to 103 lpm/m at Amar Mill complex, Dimapur. The storage co-efficient varies from 3.10^{-4} to $3.5x10^{-3}$The details of the exploratory wells constructed in Dimapur district (till 2013) is given in table-4

Table-4

Sl	Location	Depth drilled	Thickness of aquifer	Depth of construction	SWL mbgl	Discharge lpm	**D**.D m	T (m^2/day)	Specific Capacity(lpm/m)	Storage coefficient	R.Lof ground level msl.
1	2	3	4	5	6	7	8	9	10	11	12
1	Purana bazar	300	55	238	3.26	1025	11.50	301	89.13		144.338
2	Lumthi colony	300	66	272	1.28	125	24.9	4.75	5.02	3.8x10	151.533
3	Rangapahar	301	31	180	0.5 agl	52	3.5	14.45	14.66		158.558
4	Dhansiripar	301	38	281	1.20	422	30.2	79.98	13.97	3.18 x10	170.56
5	Dissagopho	285	28.5	139	10.5	265	18.79	13.66	14.10		176.335
6	Diphupar	3900	18.65	85.43	6.23	651	14.81	112.74	43.95	1.53 x10	164.975
7	Tenyiphe	100	13.63	60.09	8.10	333	28.91	8.90	22.50		189.05
8	Sewak	104.35	18	94.30	1.64	265	8.99	45.01	2.50		
9	Nagarjan	121	44	74.25	6.12	533.33	6.32	200	83.54		155.35
10	Industrial complex	73	10	68	0.73	450	25.43	27	17.69	3.5x10	155.92
11	PHE complex	226	10	63.50	6.50	333	24	158.4	13.00		150.96
12	Dimapur Town	79	20.55	61	5.16	471.6	5.89	215	81.49		150.51
13	Amar mill Complex	79	12	78	3.73	650	6.27	280	103.66		147.80
14	Kuchiabil	121	18	97	3.75	533.33	3.20	21.30	165		144.75
15	Solar mill	85	8.5	85	10.24	220	9.19	253.5	24		168.20
16	Darogapathar	76	10	61	4.20	533.33	5.88		83		144.91
17	Bade Village	187									
18	Dimapur sports complex	141									
19	Bamun pukhuri I Village	200									

15. Ground Water Resource:

The ground water resource estimation has been computed based on the guideline and recommendation of GEC1997. Hilly terrain occupies major part of the district, for which ground water data is practically not available. The hilly areas with slope more than 20% have been excluded from the computation, as they are not worthy of ground water recharge. As there is no poor quality, command /noncommand areas, so computation for ground water resource is done only for monsoon and nonmonsoon season. The present methodology used for resource assessment is as per the recommendation of GEC1997- 1) Rainfall Infiltration Method &11) Water Level Fluctuation Method.

Recharge from sources other than rainfall such as Ground water irrigation ,recharge from ponds and tanks, check dams and nala bunds is taken as nil for the district. The total annual recharge is obtained as the total sum of recharge from rainfall duringpre-monsoon and post monsoonperiod and the recharge from sources other than rainfall. The ground water resource potential for the district is shown in table-5

Table-5 Assessment of dynamic ground water resources of Dimapur district (in ham) **(as on 2009)**

Assesment unit/District	Command/ Non command/total	Net annual ground water availability (in ham)	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic & industrial purposes	Existing gross ground water draft for all uses (in ham)	Provison for domestic ^ industrial requirement supply to 2025 (in ham)	Net Ground water avaolibility for future irrigation development (in ham)	Stage of development (%)
Dimapur	Non Command	15320	nil	286.60	286.60	407.17	14913.00	1.87

The ground water resource estimation indicated that the net ground water availability in Dimapur district is 15230ham. The projected domestic and industrial use up to 2025 is 407.17 ham. The stage of ground water development is only 1.87%.

16. GROUND WATER DEVELOPMENT AND MANAGEMENT STRATEGIS.

1) Present ground water development:

The stage of ground water development in the district is only3.80% and it falls under safe category and has a very high prospect for the future development. At present the ground water development is mainly confined to the valley portion as they are the most promising zone for ground water development. The peneplained surfaces, buried pediments and the valley hills are the most favourable places for ground water development.

11) Urban and Rural water supply:

The drinking water in both Rural and Urban areas of the district is regulated and monitored by the Public Health Engineering Department and Directorate of Geology and Mining, Govtof Nagaland. The water supply is mainly from the surface water like river, pond stream spring etc. from the nearby areas. The narrow linear valleys and intermontane valleysoffer scope for development of ground water.

111) Ground water for Irrigation:

At present irrigation through ground water is not reported in the district. The net ground water availability of the district is 22388ham and the existing gross ground water draft for all uses is 851 hams only. The ground water requirement for the projected population of 2025 is calculated as 1180 ham. Thus the net ground water availability for future irrigation is 20358 ham.

17. Future Ground Water development and Management aspect:

The present ground water development in the district is seen only in Dimapur valley. The other valleys like Ghaspani- Jaluki show a very little to negligible development of ground water. Hilly terrain where ground water development has a limited scope occupies the rest area of the district. Ground water in these hilly areas manifest as springs, which is related to precipitation. Proper management and development of the springs in the hilly areas can meet the requirement of drinking water to the villages located on the higher topography.

In Dimapurvalley, Central Ground Water Board and the Directorate of Geology and Mining ,Govt of Nagaland has constructed about 18 nos of deep tube wells for water supply. The discharge of the wells in the valley area ranges from 220lpm to 1050 lpm with specific capacity ranging from 22.5 to 104 lpm/m. Hence, there is a high scope for future ground water development in the district.

18. RECOMMENDATION:

1) Stage of development in the district is 3.80% and it is mainly restricted to the valley portion. Ground Water development is being done through dug wells and bore wells in the low lying intermontane valleys.

2) The peneplained surfaces, buried pediments and the valley fills are the most favourable locations for the development of ground water. The narrow, linear valley and intermontane valley offers scope of ground water development

3) Hydrogeological studies indicate that lineaments, joints, fractures and fault are the main controlling factors for the occurrences and distribution of ground water. These geological structures can be tapped for ground water development in hard rock formations.

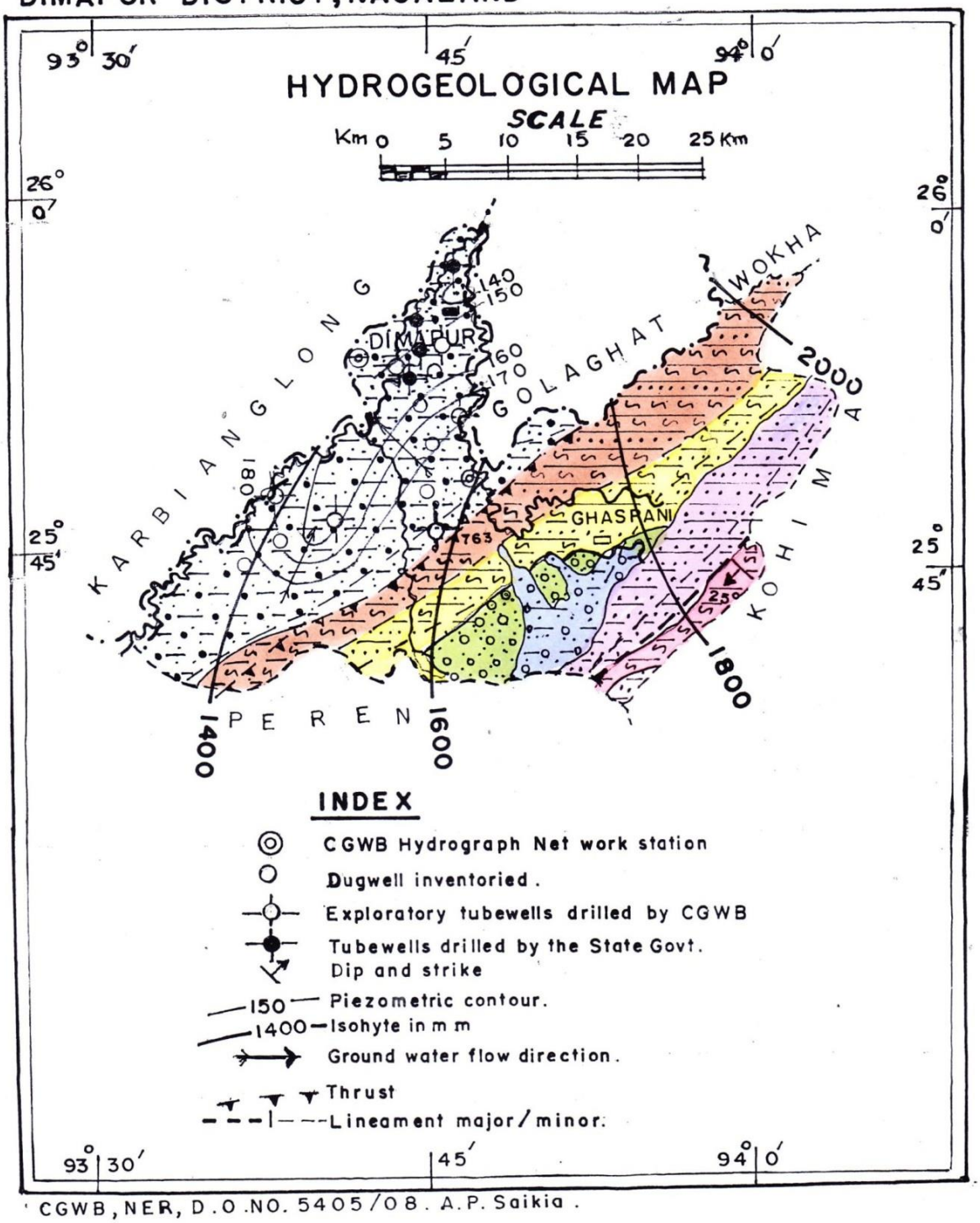
4) Presence of potential fractures must be confirmed by electrical resistivity survey for taking up exploration activity.

5) Springs play a major rule to meet the water requirement of rural people and people living on higher topography. It is found that the location of spring is mainly in foot hills and intermontane

valleys. Proper development of springs having high discharge will help in mitigating the water requirement of the people to a great extent.

6) Rainwater harvesting is another suitable technology for augmenting water for the drinking water supply for solving the scarcity of potable water for the people living in the hilly areas. It involves relatively lowcoast, less times for implementation and to provide almost safe water at doorsteps.

DIMAPUR DISTRICT, NAGALAND



CGWB, NER, D.O.NO. 5405/08. A.P. Saikia.

DIMAPUR DISTRICT, NAGALAND.

Legend

AGE		FORMATION	LITHOLOGY (with geomorphic unit)		AQUIFER DISPOSITION	GROUND WATER POTENTIAL
						Porous Media
RECENT TO SUB-RECENT	Un-Consolidated	ALLUVIUM	Valley fills, consists of clay, coarse sand, gravel and boulders.		Fan shaped alluvial deposits having gentle slope in broad intermontane valleys.	Open wells constructed with 20m depth and and 4-5m dia will have yield prospect of 10 m^3/day. Open wells constructed with 15m depth and 2-2·5m dia will have yield prospect of 3 m^3/day. Tubewells within 100-150m depth are expected to yield 15-45 m^3/hr. with drawdown more than 6m around Dimapur area.
			Piedmont alluvial plains, high level terraces consisting of clay, silt, sand with pebbles and boulders.		Gently sloping plains with moderate thickness of alluvium,	
			UNCONFORMITY			
PLIOCENE PLEISTOCENE	Semi-Consolidated	DIHING	Denudational and low lying hills and mounds, consisting of pebble bed, soft sandy clay, grit, sandstone and conglomerate		Valleys underlain by Dihing formations is likely to yield. Low to moderate, assorted and discontinuous aquifer with high argillaceous matrix.	Low to moderate yield prospects of 10-20 m^3/hr for drawdown more than 6m.
			UNCONFORMITY			
UPPER AND MIDDLE MIOCENE		TIPAM	Moderate structural hills, consisting of clay shale, coarse to gritty ferruginous sandstone and conglomerate.		The valleys underlain by Tipam sandstones from good aquifers.	Good recharge zone for high and moderate yield aquifer system at deeper depth.
LOWER MIOCENE		SURMA	Low to moderate structural hills, consisting of shale, siltstone, mudstone and ferruginous sandstone with sandy shale and conglomerate		Ground water restricted to weathered mantle and fracture development.	*Fissured Media*
			UNCONFORMITY			
UPPER EOCENE TO OLIGOCENE		BARAIL	Denudo-structural hills; Long linear ridges and highly dissected round to flat topped hills consisting of beded compact, fine to medium grained sandstone mostly less susceptible to erosion.		—— Do ——	Run off zone, Ground water occurs as spring, in filtration to ground water is controlled by development of secondary porosity in rocks caused due to action of tectonic elements.
UPPER CRETECEOUS-MIDDLE EOCENE		DISANG	High structural hills, linear, curvilinear and at places irregular hill ranges and narrow montane valleys consisting of shale and sandstone.			

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